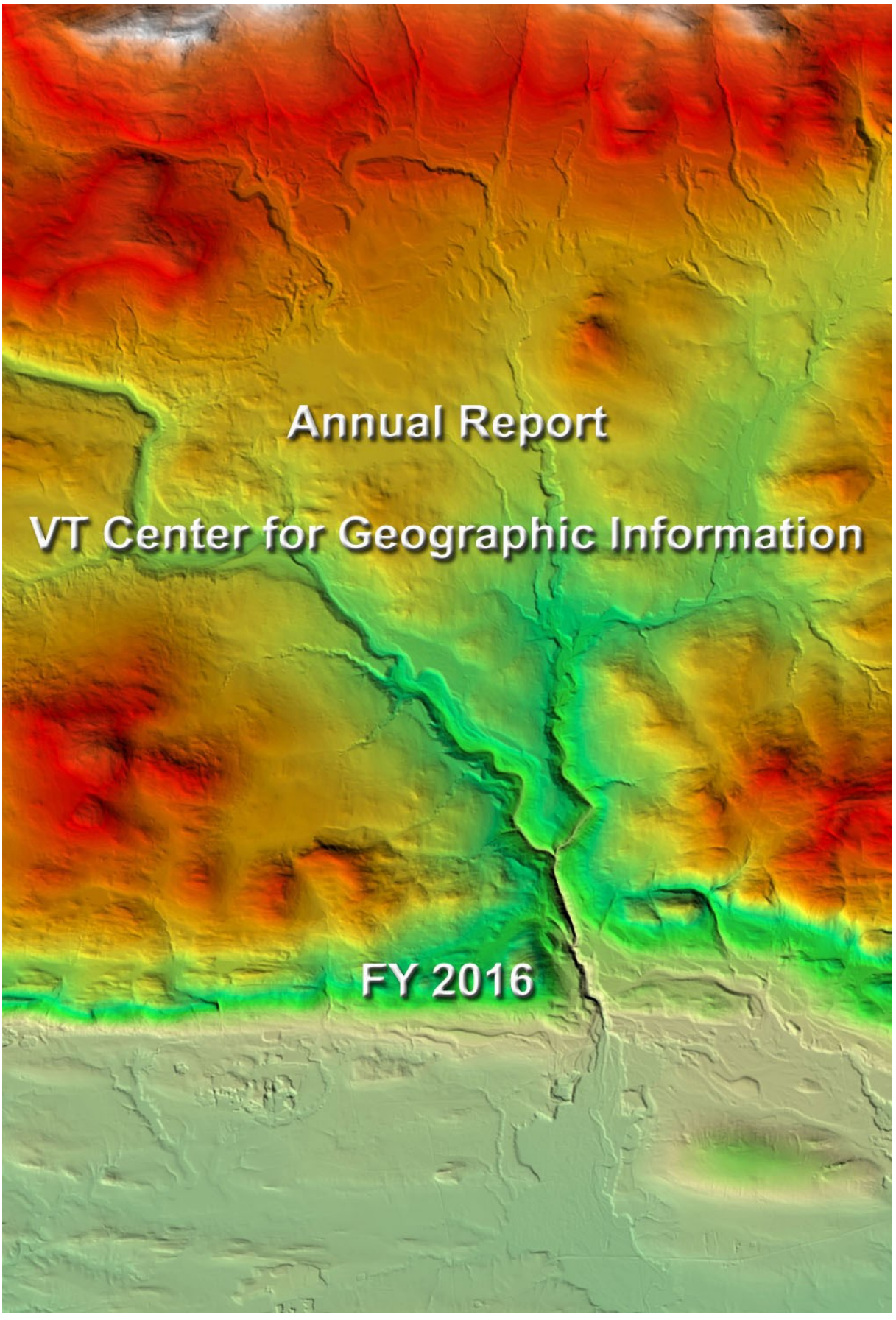
VERMONT
AGENCY OF COMMERCE & COMMUNITY DEVELOPMENT



Annual Report of the Vermont Center
for Geographic Information (VCGI)
and
Vermont's Geographic Information System (VGIS)

January 2016

For
Governor Peter Shumlin
And
Vermont House and Senate
Appropriations Committees

Prepared by the
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Cover Graphic: Color enhanced image generated from a high resolution Lidar digital elevation model covering a portion of Addison County, VT.

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February 1, 2016

Honorable Peter Shumlin
The Statehouse
Montpelier, VT 05602

Dear Governor Shumlin;

The past year has brought significant changes to the Vermont Center for Geographic Information (VCGI). Act 179, passed in the spring 2014 legislative session, led to VCGI becoming a new Division within the Agency of Commerce and Community Development (ACCD). VCGI, as a non-profit corporation, ceased operations on March 30, 2015. The Center successfully completed its transition into ACCD thanks to the tremendous support provided by ACCD's team. Now the State has an opportunity to re-engineer the Center for Geographic Information to meet the needs and challenges of the future.

The State of Vermont is nationally recognized for both its geospatial coordination activities and the availability of detailed geospatial data. In addition, geospatial technology is a rapidly expanding business area with new demands developing every year. The Center's integration into the Agency of Commerce and Community Development present the State with an opportunity to take Vermont's Geographic Information System to the next level.

I would like to recognize the staff of VCGI for their tremendous efforts in 2015. Even with significant challenges encountered during VCGI's transition into the State, the Center's staff remained focused on accomplishing the mission of the organization. VCGI staff deserves recognition for the success of the organization, but it is the involvement of the entire GIS community that makes the state's accomplishments in GIS so exemplary. This Annual Report provides a broad cross-section of the accomplishments and activities of VCGI, State agencies, and members of Vermont's robust geospatial community.

Thank you for your support of VCGI and its mission.

Sincerely,

Pat Moulton
Secretary
Agency of Commerce and Community Development

Executive Summary

VCGI's Annual Report documents the GIS initiatives and accomplishments of VCGI, State agencies, as well as the State's Enterprise GIS Consortium[1] (EGC) in 2015. VCGI completed its transition into a new Division within the Agency of Commerce and Community Development. State agencies and the EGC had another productive year, continuing efforts to foster efficient and effective use of the State's geospatial resources. State agency GIS teams focused on developing, deploying, and maintaining a wide range of geospatial solutions designed to support the business needs of their users, partners, and stakeholders. Meanwhile the EGC made headway in a number of areas including the statewide Parcel Data Program initiative, State GIS career ladder and job specifications, and development of an updated Geodata Portal. VCGI and state agencies successfully leveraged their investments in geospatial technology to support a wide range of business needs in 2015.

[1] The EGC is a voluntary consortium of state government organizations focused on effective management of State's Enterprise Geographic Information System (GIS).

Enterprise GIS Initiatives

1. **Vermont Enterprise GIS Consortium (EGC):** The EGC held monthly meetings throughout 2015. This allowed the EGC to maintain momentum on a number of work items identified in the FY 2015 and 2016 Business Plans. EGC member participation has been steady. The EGC is a voluntary consortium of state government organizations focused on effective management of State's Enterprise Geographic Information System (GIS).

2. **Statewide Parcel Data Program:** The EGC Parcel Data Workgroup held regular meetings focused on facilitating the goal of creating and maintaining a consistent and up-to-date statewide parcel dataset for VT. The Parcel Workgroup worked with AppGeo (contractor hired by VTrans) to conduct a detailed Return on Investment (ROI) and Life Cycle analysis that looked at the potential value of a consistent statewide parcel dataset, and the organizational arrangements that could be established to support a statewide parcel data program. VCGI also continued to support the development of additional town parcel data under the Northern Borders Regional Commission (NBRC) grant. VCGI's experience administering the NBRC project will help inform the Parcel Workgroup's efforts to craft an ongoing parcel program in collaboration with Vermont's municipalities.

3. **Emergency Management Workgroup:** The EGC's Emergency Management Workgroup (EMW) continued its efforts to enhance GIS capabilities and procedures that improve the use of GIS technology which supports State of Vermont Emergency Management planning and response activities.

4. **Geocortex Team:** Five agencies (ANR, AHS, E911, VTrans, and VCGI) continued to share hardware and software used to support the State's Geocortex Essentials interactive mapping platform. This enterprise application has allowed these agencies to develop and maintain interactive mapping applications that meet the specific needs of their target constituencies. In 2015 the Geocortex Team revised the Memorandum of Understanding (MOU), adding enhancements and clarifications that will improve the long-term viability of this collaborative arrangement. The Geocortex Team also successfully upgraded both the development and production systems to the latest version of the software. Efforts are now focused on migrating interactive map viewers to the new HTML5 framework.

5. **VT Open GeoData Portal Project:** In 2014 the EGC established the Open Data Workgroup (formerly called the Data Warehouse Workgroup) and directed it to work with VCGI to redesign and rebuild the State's Open GeoData Portal. However, the project was put on hold pending the completion of VCGI's move into state government (March 2015). The EGC rebooted the project in April 2015, completed a test of Esri's ArcGIS Online Open Data Platform (AGO OD), and voted to endorse this platform (July 1st, 2015) as the best solution for a new VT Open GeoData Portal. VCGI is working with ACCD's project management team to develop a deploy a new VT Open Geodata Portal in collaboration with our EGC partners.

6. **GIS Careers in State Government**: As part of the IT reclassification analysis going on for all of state government, EGC representatives proposed a GIS track that expands and aligns the

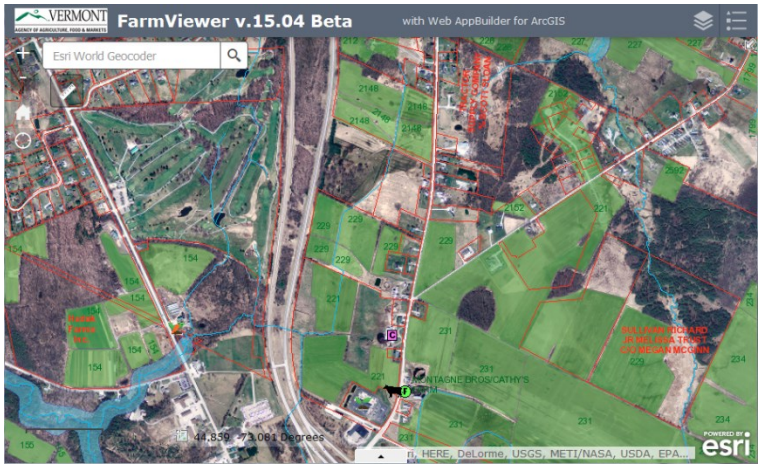
current GIS-specific positions in the state job classification system. The proposed GIS track includes tiers similar to the tiers used for all other IT tracks. The EGC finalized and endorsed (July, 2015) the proposed GIS career track and job specifications, and forwarded it to the State's Human Resources IT review committee for consideration.

7. **State GIS Governance and Strategic Direction:** The EGC began a review and revision of the EGC's Charter and the State's Enterprise GIS Strategic Plan in early 2015. The EGC reviewed and adjusted the strategic objectives defined in the Strategic Plan, and began to discuss implementation strategies. The EGC also discussed how its role might change now that VCGI is part of state government, and the VCGI Board of Directors (formerly VT GIS Advisory Board) no-longer exists. Discussions were temporarily tabled during the spring of 2015 as VCGI grappled with its move into state government, and as additional questions about VCGI's role within state government began to surface. The EGC has reengaged this effort under the auspices of the Agency of Administration's "Analysis of State GIS" project, currently being managed by ACCD's project management team.

State Agency Report

Agency of Agriculture, Food, and Markets

This year the Vermont Agency of Agriculture, Food & Markets' (VAAFM) GIS unit launched our ArcGIS Server Service, with the support of VCGI. VAAFM created a web app, for internal use only, of all of our farm data to date, called FarmViewer.



FarmViewer is enabling non-GIS users in the home office, field offices and the field itself to engage with our spatial data. This has proved essential to support the increased load of small farm inspections required from the water quality bill passed by the legislature this past spring. VAAFM is also creating a second GIS position to focus specifically on water quality data. This fall VAAFM's GIS unit is creating new connections to the agency's animal health datasets in preparation for the likelihood of local cases of Avian Influenza. These new connections could be the Rosetta stone of connecting the Water Quality unit's datasets and the Animal Health unit's datasets. In the coming year VAAFM's GIS unit plans to generate a unified agency farm dataset. VAAFM hopes to be able to share this dataset with other state agencies, and also make FarmViewer a read-write application from the field.

Agency of Natural Resources

The ANR Office of GIS had another great year with many accomplishments. Some of the highlights include:

The release of the Natural Resources Atlas HTML5 viewer to the public. This viewer makes the popular Natural Resources Atlas available without the need of a plugin and also enables the viewer to be available on mobile devices and tablets. This new viewer utilizes the HTML5 programming framework which gives the viewer a longer shelf life with added functionality and ease of use to the end-user.

Many communities have benefited from the ANR GIS Urban Tree Collector Application. ANR GIS leveraged the ArcGIS Collector mobile application to develop an application for the Vermont Urban and Community Forestry Program to inventory trees across 20 different 'urban' communities across the state. This application will facilitate a strategic plan for community trees and will also help train town employees in best practices for tree care.

ANR GIS has been active in the participation in Agency Lean events. Many outcomes from Lean events are recommendations for better IT applications. ANR GIS has been involved to help facilitate the recommendations in the process to ensure that they are manageable and sustainable.

ANR GIS has spent time creating an ANR Open GeoData portal. Much of the data that is available on the Agency's Natural Resources Atlas is now available for download in an Open Data format from our ANR portal.

Other-Powered Driven Mobility Devices (OPDMD) Project – ANR GIS assisted Forests, Parks and Recreation address a Department of Justice (DOJ) regulation implementing Title II and Title III of the 1990 Americans with Disabilities Act (ADA). ANR GIS created a secure web map and provided training for staff to identify where appropriate OPDMD vehicle classes are reasonable.

Linear Referencing for Roads and Trails on key ANR Units – ANR GIS compiled data from the Forestry Districts and other sources and built measured routes. The measured routes can be used to store any number of features without segmenting it. It is the preferred system for managing road geometry and information with many State Transportation Agencies including VTrans.

Natural Communities GIS Standard and data development – ANR GIS develop a data standard for completing Natural Community mapping within the State of Vermont. The standard includes all the described natural communities in the State and makes it easier for Ecologists completing the mapping. All the existing mapping completed over the last decade has been brought to standard and is available for viewing using the Natural Resources Atlas.

Protected Lands Reboot – ANR GIS is an active participant updating the Protected Lands, formally Conserved Lands, GIS Standard. The dataset with contributing organizations at the Federal, State, Municipal, and Private organizations will be a single-source for protected lands within the State of Vermont.

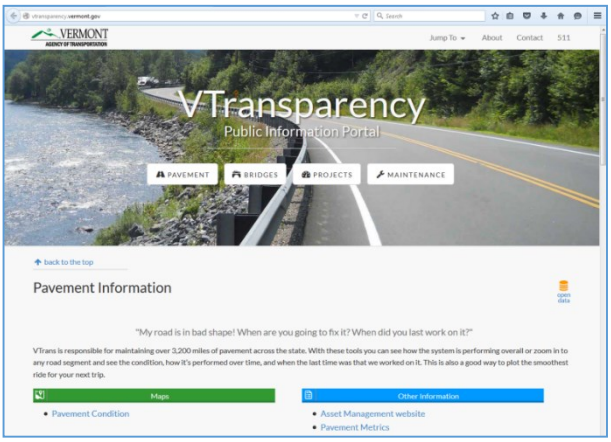
Materials Management Application (Organics) – ANR GIS developed a mapping tool to connect various stakeholders across Vermont with solid waste services and resources. It can be used as a visual, interactive aid for general planning purposes and for Universal Recycling requirements (ACT148)

Flood Ready – ANR GIS Created a mapping tool called the Flood Ready Atlas. The Vermont Flood Ready Atlas is an online-map tool that can help you identify critical facilities, transportation services and buildings in your community that are at risk of damage from flooding. The Atlas can also help you identify local watersheds and the extent of natural flood protection provided by forests, wetlands, floodplains and river corridors.

EGC Geocortex System Administration – ANR GIS took on the role as the primary Geocortex System Administrator in 2015.

Agency of Transportation

Vermont's Transportation data layers consist of road centerline, railroad, bridge, airport, small culverts, and other transportation assets, as well as transportation related metrics including traffic volume, crash locations, pavement condition, and others. GIS data layers are integral to the internal workflows of the Agency and are continuing to expand in mapping, right of way, asset management, project development and the visualization of the overall assessment of the transportation infrastructure.

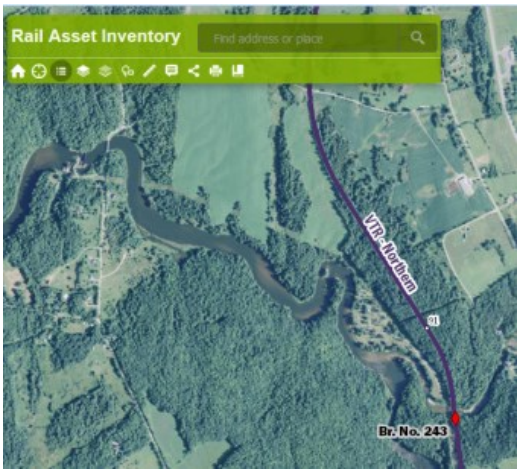


Over the course of the last year, more emphasis has been put on the deployment of web maps through VTransparency (http://vtransparency.vermont.gov/) with access to pavement condition, bridge closures and inspections, project information, and maintenance activities. The data through VTransparency can also be accessed via the VTrans Open Data Portal at http://vtransparency.vtrans.opendata.arcgis.com/.

The VTrans Data Management Section developed and implemented mobile data collection applications in ArcGIS Online and ArcCollector for transportation asset data collection in the Maintenance Districts and provided training to transportation workers statewide. These provide a GIS-based framework for transportation maintenance operations, including litter picking, mowing, guardrail work, and pavement markings. Data Management Staff continues development of additional applications for other maintenance activities. The Data Management Section also continues GIS work on pavement condition, construction projects and expects to complete the Small Culvert Inventory in the near future.

The VTrans Right of Way Section has continued to develop and expand the VTrans Right of Way Viewer (http://host.appgeo.com/vtrans/) that leverages GIS to provide access to state highway right of way and plan information. Through the viewer, users can view georeferenced project plans, right of way boundaries, parcels and other features through their browsers, greatly increasing the ability to access this data for a specific location.

The VTrans State Rail Program leverages GIS for asset management, rail crossing inventory, bridge inventory and inspection, property management, and the project development. Data layers are being developed to improve internal work flows and provide information on rail assets and condition to Rail staff and the public via the web maps at http://rail.vermont.gov/.



VTrans continues to support the statewide LiDAR acquisition and parcel mapping efforts by providing resources to both of these initiatives. This includes the delivery of a Return on Investment Study and Data Maintenance Plan for the statewide parcel mapping, which were developed by a contractor for VTrans.

The VTrans Mapping Section maintains the road centerline data layer and linear reference system, used as primary data layers by VTrans GIS, but also made accessible through VCGI. Mapping continues to work collaboratively with E911, with both organization adopting the same data schema, and VTrans has conflated 45% of the E911 data to the road centerline geometry.

The transportation data for Vermont continues to be in good condition and is expanding. VTrans has maintained and improved an accurate, robust, and up-to-date repository of data. This data is becoming essential for standard business functions and relied upon by many Sections throughout the Agency. VTrans continues to collaborate with State Agencies in the development and sharing of GIS data and has deployed a portion of this content via the VTrans Open Data Portal.

Department of Health

The Vermont Department of Health (VDH) uses GIS technology for a variety of public health purposes, including public health surveillance, public health planning, health data reporting, and emergency preparedness. Currently, VDH has approximately 25 staff using GIS technology at levels ranging from basic map-making to sophisticated geographic analysis to web application development. VDH GIS activities are coordinated by a department GIS Manager who works closely with a half-dozen department staff who are advanced desktop GIS software users and with appropriate IT staff, including the Systems Developer who administers the department's web GIS infrastructure and two Database Administrators (DBAs) who administer the department's SQL-Server GIS databases.

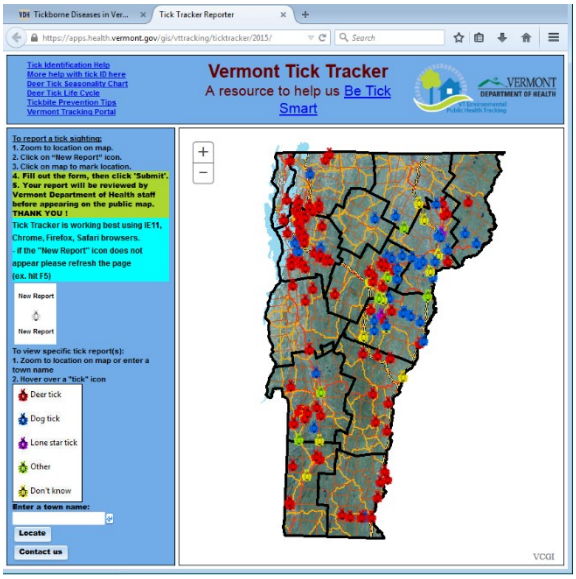
Day to day public health GIS work typically involves developing /maintaining GIS data and using that data to support public health programs by performing spatial analyses or creating map products. Map products are deployed as stand-alone maps, as maps embedded into reports, or as maps deployed to the web (internally or publicly).

The VDH GIS landing page (www.healthvermont.gov/GIS) briefly describes public health GIS activities at VDH and identifies department programs that make active use of GIS technology.

Several new public health GIS resources were updated or added to the public-facing VDH healthvermont.gov website during 2015, including:

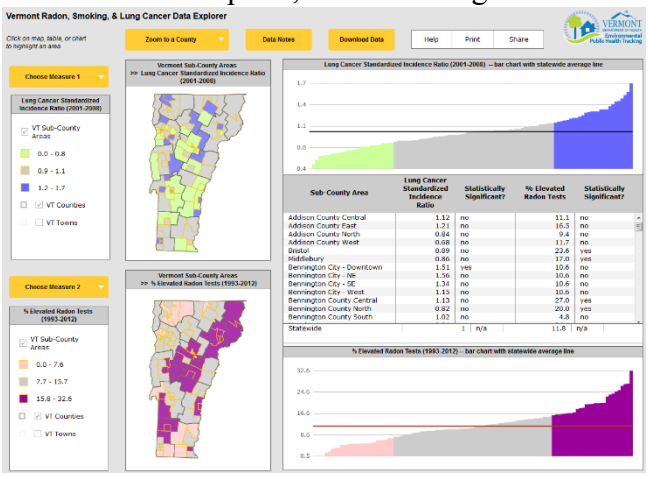
A new X-Ray Inpections Data Explorer (http://healthvermont.gov/enviro/rad/rad_health.aspx), launched in early 2015, displays score-card results for statewide dental, medical, chiropratic, podiatric, and veterinary practices.

An updated Blue-Green Algae Tracker, improved from 2014, reports blue-green algae weekly testing results for Lake Champlain and 5 inland lakes that are collected by the Department of Environmental Conservation, VDH, and the Lake Champlain Committee. Companion applications allow trained citizen scientists to submit weekly water condition reports that are then moderated by staff from the Lake Champlain Committee, the VT Department of Environmental Conservation, and the VT Department of Health. The 2012, 2013, and 2014 testing results will remain accessible as archived season summaries. The Blue-Green Algae Tracker may be expanded in the future to include other frequently visited lakes and ponds across the state.



The Tick Tracker interactive web map (www.healthvermont.gov/ticktracker) allows website visitors to report observed tick conditions and to see the reports submitted by others. The web map also provides links to important educational information that can help people "Be Tick Smart".

The Vermont Environmental Public Health Tracking (EPHT) portal, featuring map-driven dashboard data reports, continues to grow. Over 200 data measures can be accessed using an interactive query tool that serves the dashboard-styled reports. Search for Vermont Tracking data reports by browsing to http://www.healthvermont.gov/Tracking. One recent "Vermont Highlights" report is the Radon, Smoking, Lung Cancer Data Explorer.



The Healthy Vermonters 2020 webpage (www.healthvermont.gov/hv2020) also continues to expand the availability of map-driven dashboard data reports. People can visit the HV2020 webpage to see maps and trend data for many health indicators that have been identified as public health priorities and are accompanied by targets that will guide the work of public health in Vermont through 2020.

In addition to public health GIS resources that are available to the public, VDH maintains a variety of internal-use-only (restricted) GIS web resources for VDH and other Vermont State Staff. These include web base-maps that support emergency preparedness/response work and local/rural health work.

Public health GIS activities span many different areas of expertise. Looking to the future, public health GIS activities at VDH will involve an increasing number of web applications, both PC and mobile-device based, that display maps and location-specific data.

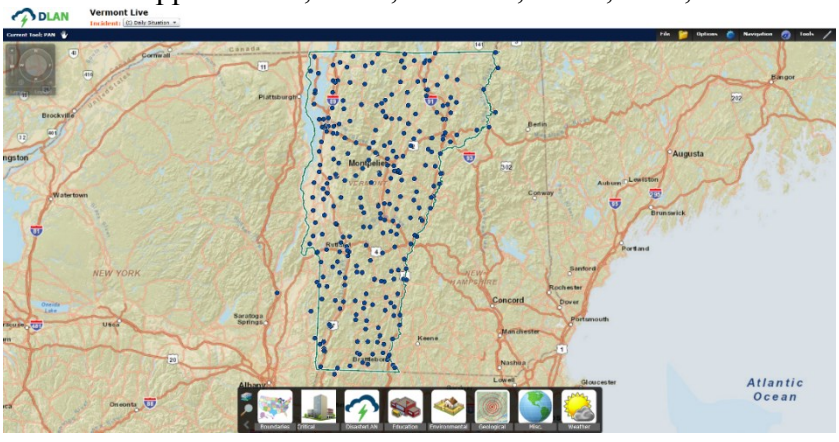
As part of a 2015 department-wide effort to document public health data analysis and presentation best practices, a work group of VDH GIS users is currently developing guidelines for performing small-area cluster analysis. These guidelines will be presented at the November 2015 NEARC conference in Burlington, VT.

Division of Emergency Management and Homeland Security

The Division of Emergency Management and Homeland Security (DEMHS) uses GIS for numerous emergency management purposes including, situational awareness for the State Emergency Operations Center (SEOC), hazard mitigation planning and project mapping, dam inundation mapping, plume tracking related to radiological emergencies, and critical infrastructure identification and planning. Currently, DEMHS, through partnerships with all 11 of the regional planning commissions in the state, has a GIS staff of 14 should the SEOC activate for an exercise or real world event. This staff comprises the GIS Unit and reports to the Planning Section in the SEOC.

On a day-to-day basis DEMHS utilizes DisasterLAN (DLAN), a web-based incident management system that has an integrated GIS COP Viewer. The DLAN GIS COP Viewer allows DEMHS to fuse together geospatial information from any external or internal source onto one common display. Some of these sources include feeds and/or data layers from the U.S. Geological Survey (USGS), National Weather Service (NWS), National Oceanic and Atmospheric Administration (NOAA), VTRANS 511, E911, U.S. Census Bureau, and the Federal Emergency Management Agency (FEMA) to name a few. DLAN supports SHP, KML, GeoRSS, WDT, CSV, and other flat file formats. All information within the DLAN GIS COP Viewer can be shared with any other DLAN user, exported, and printed.

The figure below is a 2015 example of the DLAN COP Viewer. It shows all local emergency services departments in the state.



VCGI Report

VCGI Core Activites and Operations

VCGI Web Map Services

VCGI continues to host and maintain several web services that help State government partners and Vermonters with their mapping needs. These include the VT GIS Basemap service, cached imagery services, and address geocoding service. VCGI has developed this suite of web services in coordination with our EGC partners, and has worked to align it with the EGC's Web Services Strategy. These services are used in a number of state web applications including but not limited to;

- Vermont Interactive Map Viewer (VCGI)
- ANR Natural Resources Atlas
- VT BioFinder (Agency of Natural Resources)
- E911 Map Viewers
- Vermont Tick Tracker (VT Department of Health)

VCGI hosted web map services are also used by public and private constituents who need them to streamline their workflows. For example, VCGI cached imagery services eliminates the need to download thousands of VT orthophoto image tiles. Instead the user can "web stream" the imagery into their web browser or mapping software, saving countless hours downloading and organizing the imagery.

Geospatial Data Updates

VCGI posted many new and updated data layers to Vermont's Open GeoData Portal during 2015; many of these data layers were provided by partner organizations. We thank our partners for their contributions. The following table lists data layers that were posted during 2015.

Data Resource Name	Description	Post Date
CadastralParcels_VTPARCELS	VT Parcel data provided by towns and RPCs	6/9/2015
EcologicOther_RTENATCOM	Rare, Threatened and Endangered Species & Significant Comm.	9/29/2015
EcologicOther_UNCOMSPOF	Uncommon Species and Other Features	9/29/2015
ElevationDEM_ORTHODEMV3	VT Orthophoto DEMs - V3 - FOR ORTHO PRODUCTION ONLY	11/5/2015
EmergencyE911_ALPINELIFTS	E911 alpine ski lifts data layer	7/5/2015
EmergencyE911_DW	Driveways captured for E911 use	7/5/2015
EmergencyE911_ESA	E911 Emergency Service Agency Locations	7/5/2015
EmergencyE911_ESITE	E911 Site locations (buildings, hydrants, public phones, etc.)	7/5/2015
EmergencyE911_ESZ	E911 Emergency Service Zone data layer	7/5/2015
EmergencyE911_FOOTPRINTS	E911 building footprints layer (limited set of buildings)	7/5/2015
EmergencyE911_GDBE911	All E911 data layers in File Geodatabase format (v10.2.2)	7/5/2015
EmergencyE911_HYDRANTS	E911 Fire hydrants data layer	7/5/2015

Data Resource Name	Description	Post Date
EmergencyE911_JBOUND	E911 town boundaries data layer	7/5/2015
EmergencyE911_LANDMARKS	Landmarks captured for E911 use	7/5/2015
EmergencyE911_LKUPTABLES	E911 lookup tables - tabular	7/5/2015
EmergencyE911_RDS	E911 Road centerlines from 1:5000 orthophotos and GPS	7/5/2015
EmergencyE911_SHEETS	E911 Atlas Map Sheets Boundaries	7/5/2015
EmergencyE911_TRAILS	E911 trails data layer	7/5/2015
EmergencyFlood_WINWATVT	Flood Maps including TS Irene for the Winooski in Waterbury	6/30/2015
FacilitiesBuildings_VTPUBLIB	Vermont Public Libraries	1/2/2015
GEOCODES	Lookup tables with codes corresponding to the VGIS Geographic Area Codes Standard	6/30/2015
GeologicSoils_ONSITE	Onsite sewage disposal ratings for Vermont soils	10/28/2015
GeologicSoils_SO	Soils - Natural Resource Conservation Service soil survey	10/28/2015
GeologicSoils_SOAG	Agriculturally Important Soil Units from SSURGO Soil Data	10/28/2015
LandLandcov_LCLU2006	2006 NLCD clipped by union of WBD Sub basins and VT boundary	1/20/2015
LandLandcov_LCLU2011	2011 NLCD clipped by union of WBD Sub basins and VT boundary	1/20/2015
NAIP_1M_CLRIR_2014	2014 - Color & Infrared (4 band) Aerial Imagery - Statewide NAIP (1m)	3/16/2015
SDE_DUMP	SDE data dump - EGC Data Exchange Services	8/28/2015
SOILATTR	NRCS TOP20 soils attributes and documentation	10/28/2015
TransRoad_LRS2014	VTrans Linear Reference System (2014)	7/27/2015
TransRoad_RDS	VTrans Master Road Centerline Dataset	8/8/2015
TransRoad_RTLOGPTS2014	VTrans 2014 Route Log intersection and LRS calibration pts	7/27/2015
TransStructures_BCVOBCIT	VT Town Bridges and Culverts	5/26/2015
TransStructures_BCVTRANS	VTrans Bridge & Culvert Inventory	7/27/2015
UtilityOther_ELCFRANCHISE	Vermont Electric Utility Franchise Areas	4/28/2015
UtilityTransmit_GMPPOLES	Green Mountain Power (GMP) pole data	9/23/2015
UtilityTransmit_VECDISTLINES	VEC Primary Overhead and Underground Distribution Lines	5/22/2015
VTORTHO_0_5M_CLRIR_2014	2014 - Color & Infrared Aerial Imagery - Northeastern Vermont (0.5m)	1/27/2015
VTORTHO_0_5M_CLRIR_2015	2015 - Color & Infrared Aerial Imagery - Southern Vermont (0.5m)	10/30/2015
VTORTHO_0_5M_PAN_2014	2014 - Black & White Aerial Imagery - Northeastern Vermont (0.5m)	2/16/2015
VTORTHO_0_5M_PAN_2015	2015 - Black & White Aerial Imagery - Southern Vermont (0.5m)	11/13/2015
WaterHydro_RIVERCORRIDORS	Vermont River Corridors dataset	1/7/2015
WaterWetlands_VSWI	VT Significant Wetlands Inventory (VSWI)	7/9/2015

VCGI System Administration

VCGI successfully migrated all outstanding elements of its IT infrastructure into the State's environment. VCGI is now completely integrated within DII's and ACCD's IT environment. We continue to monitor, maintain, and upgrade our IT infrastructure to ensure continuity of services to our constituents inside and outside of state government.

VCGI Projects

Open GeoData Portal Project

VCGI staff, ACCD Information Technology staff, and the Enterprise GIS Consortium (EGC) continued efforts toward migrating Vermont's Open GeoData Portal to a more modern system during 2015. The project charter of this modernization project was updated after VCGI's move into state government. The project is moving forward with project management assistance from ACCD Information Technology along with contributions and input from portal stakeholders.

Modernizing the Open GeoData Portal is very timely, given that over the years, GIS content (data) has become more diverse and expansive while its consumption method has evolved from file-download services to data feeds that are wired into applications. Modern data portals are on accord with this evolution, as they attempt to organize and efficiently serve the expanding array of diverse GIS data assets.

Northern Borders Regional Commission Parcel Project

VCGI, in partnership with the northern border Regional Planning Commissions, was successful in implementing a grant from the Northern Border Region Commission to develop digital parcel data for 19 towns in the region. This project can serve as a prototype for a future statewide digital parcel data project. This project also supported the ongoing sustainability of the parcel data created, because the participating towns increased their internal capacity to deal with parcel updates, and developed plans for how those updates will be funded.

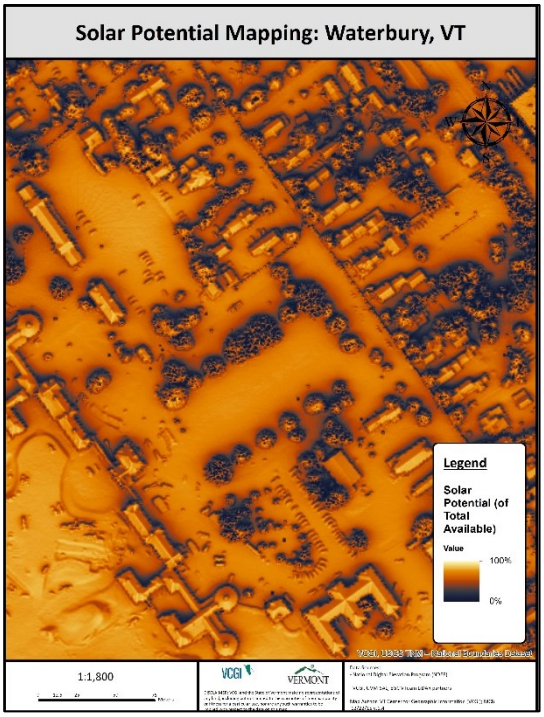
VT Renewable Energy Atlas Project

The remainder of this project was funded in 2015 and solar LiDAR potential data was computed for all areas of Vermont with LiDAR data availability. Employing high accuracy Digital Surface Model (DSM) data derived from LiDAR enables the modeling of solar potential on all surfaces while accounting for shading, slopes, average climatic conditions and both time of day and year.

VSJF will integrate these results with the "Community Energy Dashboard" effort sponsored by the Energy Action Network, an organization based in Montpelier, VT. The publicly available data will allow any business or individual to explore solar potential and to compare actual solar array production numbers with the estimated values.

The solar potential data dovetails well with the dashboards goals "…to enable communities to understand their energy use and make clean energy choices and investments across all energy sectors: electric, thermal, and transportation." For more information on this effort please see their website - eanvt.org/community-energy-dashboard/.

The ability to create additional solar potential from future availability of LiDAR source data is only limited by available funding.

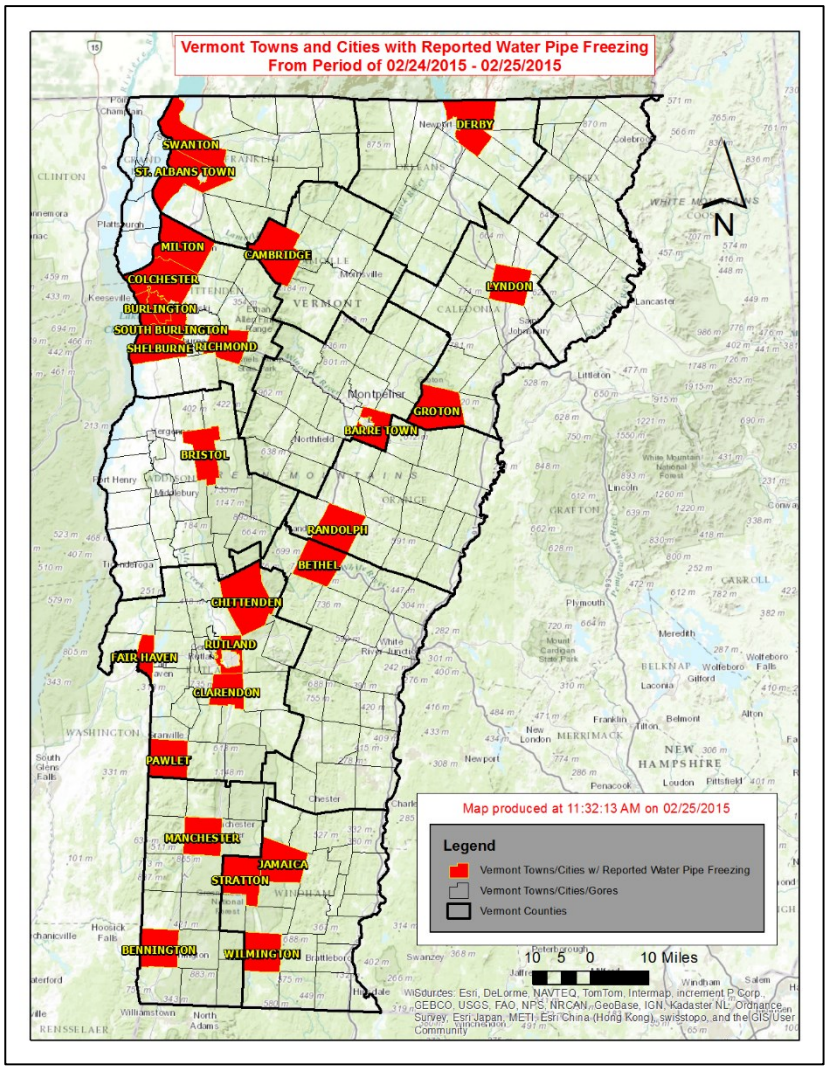


VCGI Technical Support Services

Vermont Agency of Agriculture, Food, and Markets (VAAFM)
VCGI and the Vermont Agency of Agriculture, Food, and Markets (VAAFM) have continued a service level agreement by which VCGI hosts enterprise GIS databases and web services for VAAFM as needed. VCGI hosts enterprise GIS databases for VAAFM, providing infrastructure for VAAFM's advancement of GIS capabilities. VCGI staff look forward to continuing support to an evolving robust GIS implementation at VAAFM.

Vermont Division of Emergency Management and Homeland Security (DEMHS)
VCGI continued to provide technical and professional services to DEMHS during FFY 2015 through a service agreement. The services covered a wide spectrum of functional areas, including production of impromptu situation maps, updates to SEOC (state emergency operations center) GIS documentation, and emergency management data asset development. VCGI also provided leadership to the state's Enterprise GIS Consortium (EGC) Emergency Management Workgroup.

As an example of impromptu map production, on February 25 DEMHS requested a map depicting towns in which water pipe freezing had been reported during the date range of February 24 through February 25. A list of 27 localities was provided to VCGI along with the request. VCGI produced and provided the map on the same day.



During 2015, with input from emergency management GIS stakeholders, including the EGC Emergency Management Workgroup, VCGI released an updated and improved edition of the State of Vermont SEOC GIS Manual. The manual provides helpful documentation on the use of GIS technology in the SEOC. It includes standard orders of procedure, workflow guidelines, and information on access to particular GIS data resources.

One significant betterment found in this new edition of the SEOC GIS manual is documentation on how to access data resources that are related to particular event types (flooding, winter storms, radiological, fire, etc.). This reinforces the manual's applicability to all hazards. Furthermore, the amount of time required for gathering data that is needed for producing dynamic analytical map products is reduced.

During 2015, VCGI completed development of a solution that maps hazard mitigation project information. Previously, the information was stored in Excel format without a GIS data layer derivative. VCGI established a web map editing application named *Hazard Mitigation Projects Web Mapping Editor* that allows the DEMHS Hazard Mitigation Team to map the information into a GIS data layer. The data layer is stored in an enterprise GIS database for use within DEMHS and provision of data to stakeholders. This solution supports geographic visualization and analysis of hazard mitigation project information.

VCGI also continued collaboration with DEMHS, the Regional Planning Commissions, the Vermont Enhanced 9-1-1 Board (E911), and VDH to improve collection and quality of critical facilities data. In April, the state's Enterprise GIS Consortium (EGC) Emergency Management Workgroup met to plan a new and improved critical facilities database design. The workgroup determined that the new database design should be driven by characteristics of data sources and business needs. Business needs of critical facilities data were identified; Those business needs are listed in the following table.

Business Needs of Critical Facilities Data
Base Mapping
Dam Inundation Analysis
Informing Critical Infrastructure Interdependency Analysis
Proximity Analysis
Risk / Hazard Assessment
Situational / Domain Awareness
Updates to Hazard Mitigation Plans
Adjunct to Other data holdings

VCGI developed a new edition of a web mapping editor named *Critical Facilities Data Collector* which allows regional planning commissions (RPC's) and other critical facilities data producers to update critical facilities data over a password-protected connection. VCGI also established a password-protected read-only web mapping application named *Critical Facilities Data Viewer* and a data feed (web service) for read-only use. These web-based systems support efficient and secure collection of high quality critical facilities data from RPC's and other organizations into a centralized database.

Community Engagement and Outreach

VCGI Involvement at the National and Regional Level

Steve Sharp, VCGI's Interim Director, served as the Immediate Past President of the New England Chapter of the Urban & Regional Information Systems Association (NEURISA) in 2014. URISA is an association of professionals using Geographic Information Systems (GIS) and other information technologies to solve challenges in state/provincial, regional and local government agencies and departments. Mr. Sharp also became Vermont's Representative to the National State Geographic Information Council (NSGIC). NSGIC's mission is to promote statewide geospatial coordination activities in all states and to be an effective advocate for states in national geospatial policy and initiatives, thereby enabling the National Spatial Data Infrastructure (NSDI).

Starting in 2016 Mr. Sharp has also joined the Board of Directors of the GIS Certification Institute (GISCI). The GIS Certification Institute (GISCI) is a tax-exempt, not-for-profit organization that provides the international GIS community with a GIS certification program. GISCI is the leading GIS certification opportunity for the broadly defined GIS profession.

Certified GIS professionals (GISPs) must show proficiency in three areas to be awarded certification; 1.) Educational Achievement, 2.) Professional Experience, and 3.) Contributions to the Profession.

VCGI GIS Training Offerings

VCGI Webinars: VCGI offered 6 webinars during the fall of 2015 and plans to offer at least six more in early 2016. Around 125 people participated in webinars during the fall. Presenters include VCGI staff, private sector consultants, academic staff, and state employees. Participants include people from both the public and private sectors.

VCGI Introduction to GIS/GPS training: VCGI partners with VT Technical College (VTC) to offer this training. The trainings were offered at the VTC campuses in Williston and Randolph. 20 people participated in these trainings to learn how to use free GIS software and a handheld GPS unit.

Other Events and Activities: In addition to training and online outreach, VCGI's Outreach Coordinator organizes and participates in events and activities around the state with a variety of different interest groups.

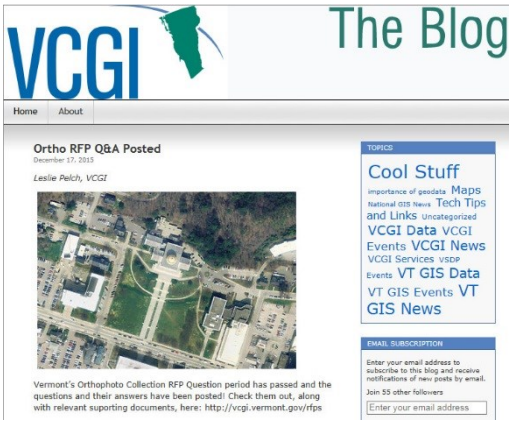
Events and Activities VCGI Organized in 2015

- January - March - Webinars
- March – Legislative Display on GIS/Mapping in VT in the Card Room
- June – VCGI Mapping Forum in Montpelier, various GIS topics (picture above)
- July – Introduction to GIS/GPS 2-day trainings in 2 locations
- October - December – Webinars

VCGI Social Media Metrics

VCGI has a Facebook Page: 324 people "like" VCGI on Facebook (up 98 from last year). We post information about events, data, and resources.
https://www.facebook.com/vermont.center.for.geographic.information/

VCGI has a Blog: 55 active subscribers (up two from last year) receive emails letting them know when something new is posted at this web page. We post articles about events, data, links to resources and interesting information. http://vcgiblog.wordpress.com/



VCGI continues to have an active Email Listserv: The listserv is another venue for VCGI to provide information about data and events, but also provides a forum for 845 subscribers (up 75 from last year) to post technical questions and get quick answers.

VCGI has a Twitter Account: We have 223 followers (up 52 from last year) and a Klout of 34. VCGI tweets and retweets messages relevant to mapping and GIS in VT and beyond. **@VCGI**

VCGI has a LinkedIn company page: We have 214 followers (up 76 from last year). We post information about VCGI, GIS data, and other related information.

VCGI has a You Tube Channel: We have 1323 subscribers. We post recorded webinars at our You Tube Channel.

Spatial Data Infrastructure

This section of the Annual Report provides a status of several of the most active statewide data management and acquisition efforts during 2015.

Vermont Ortho Imagery

VCGI manages the VT statewide ortho imagery program, which includes acquisition of the imagery, quality control and dissemination of the imagery. The imagery is made available free to the RPCs, and Towns in uncompressed format. The public has access to the same data in compressed format through VCGI's free data download capability and anyone may purchase the data in uncompressed format on a hard drive from VCGI at the cost of reproduction (in alignment with Vermont's public record laws). VT's Regional Planning Commissions's (RPCs) have volunteered to work closely with their member towns to provide the ortho imagery in hardcopy, as per both statute and need, while the State Archivist provides access to all historical hardcopy orthophotos.

True color and infrared ortho imagery was successfully acquired in the spring of 2015 over Bennington and Windham county areas. This caps Vermont's most recent five-year round (2011-2015) of ortho imagery acquisition for the state, providing users with the latest standardized leaf-off color and infrared ortho imagery.

VCGI, in collaboration with BGS and our state partners, released an ortho RFP for the next five-year round of ortho imagery acquisition (2016-2020). We anticipate having a new contractor in place for the spring 2016 acquisition window.

The matrix below shows the vintages of the statewide ortho imagery acquisition areas by county. However, the production area does not align with county boundaries. The names generally designate a general region and not a complete county coverage. All counties are completely covered by the end of the five-year acquisition period.

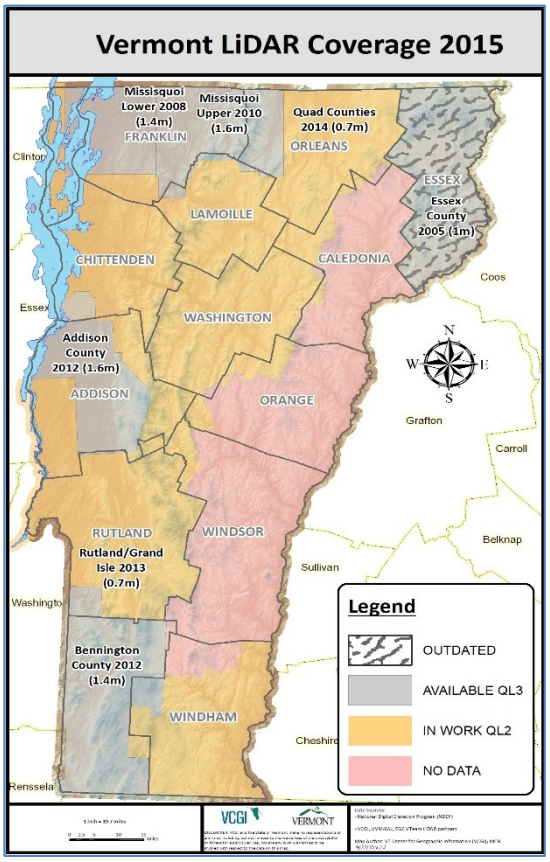
County	Vintage #1	Vintage #2	Vintage #3	Vintage #4	Vintage #5	Latest Update
Addison	1978	1995	2006	2012		Completed
Bennington	1974	1992	2000	2010	2015	Completed
Caledonia	1982	1999	2006	2012		Completed
Chittenden	1978	1988	1999	2007	2013	Completed
Essex	1982	1999	2009	2014		Completed
Franklin	1978	1995	2008	2013		Completed
Grand Isle	1978	1995	2008	2013		Completed

Lamoille	1979	1996	2007	2013		Completed
Orange	1979	1998	2006	2014		Completed
Orleans	1982	1999	2008	2014		Completed
Rutland	1975	1994	2006	2011		Completed
Washington	1979	1996	2006	2012		Completed
Windham	1974	1989	2000	2010	2015	Completed
Windsor	1975	1994	2006	2011		Completed

Lidar and High Resolution Elevation Data

Elevation data in Vermont consists of Digital Elevation Model (DEM) data and land contour information. DEM data provided by the USGS at 10m resolution has been distributed by VCGI for years with derived contours (20 ft) used to show general topography. The 2011 flooding and destruction from Tropical Storm Irene emphasized the impact of states inadequate DEM and following the event FEMA recommended that Vermont acquire a high-resolution elevation model in order to support future hazard mitigation efforts. The emergency and public safety community and a broad range of other critical state interests have identified a statewide high resolution DEM as a significant need. The most effective means of acquiring this data is through airborne Light Detection and Ranging (Lidar).

The cost of statewide LiDAR is primarily dependent upon the product specifications (i.e. accuracy, post spacing), the types of derivative products that are requested (i.e. contours, hydro-enforced DEM), and the size of the project. Cost and accuracy are further determined in Vermont by the terrain and tree cover of the collection area. Vermont has adopted the National Digital Elevation Program's (NDEP) Lidar Quality Level 2 "QL2" product specification on all future projects, which will ensure alignment and consistency with current projects at a horizontal point spacing of 0.7m and vertical accuracy of 9.25cm.



Historically, there have been partnerships of funding organizations that have come together to provide the necessary funding for regional LiDAR acquisition projects in the state. Past funding sources for regional LiDAR projects have been FEMA, USGS, USDA, VTrans, ANR, LCBP, CCRPC and MPO. While the Federal/state/other partner model of partnership funding will almost certainly continue, the state funding portion should be cautified into an annual budget appropriation similar to the digital orthophoto program.

The VT Lidar Initiative (VTLI) is a multi-agency effort coordinated by the EGC's Lidar Workgroup to support the acquisition and dissemination of the statewide elevation model based on Lidar technology. The workgroup is comprised of federal, state and local partners, each advocating for this effort within their organizations and in the public arena as opportunities arise. As the state GIS coordinating organization, VCGI has committed to the success and long-term support of this effort by designating staff in a state Lidar coordinator role.

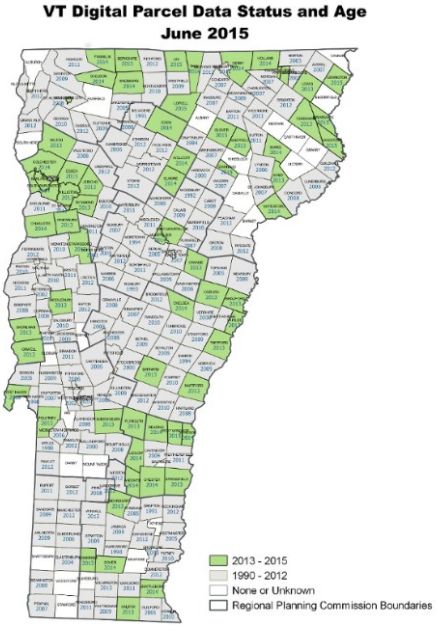
In pursuit of its goal for statewide high resolution elevation data coverage, VCGI, in coordination with state and federal agencies, helped secure funding for an additional 662 square miles of Quality Level 2 (QL2) data in 2015. Combined with previous efforts this brings state QL2 coverage to 4,625 square miles (49%) with QL3 coverage standing at 2,000 square miles (21%). With help from initiative members and successful navigation of the pre-proposal, coverage for the remaining 30% (2,858 sq. mi.) of the state is actively being pursued through the 2015/2016 USGS Broad Agency Announcement (USGS BAA) grant program. Final awards are expected to be announced early in 2016 and a successful bid would leverage matching USGS funds to collect QL2 data capable of supporting 1' contours and 0.7m resolution elevation products.

While not yet available, the higher accuracy, "QL2" 0.7m resolution data has been 100% flown for Chittenden, Grand Isle, Lamoille, Orleans, Rutland, Washington and Windham counties. While this acquired data takes many months to process, the majority of these areas will become available to VCGI throughout 2016 and made publicly available within a few months of receipt.

Existing LiDAR coverage exists within Vermont in Addison (1.6m resolution), Bennington (1.6m) and Essex (1m) Counties and most of Franklin county in the Missisquoi subbasin (1.4 & 1.6m).

Parcel Data

In 1988, Vermont's five-year GIS Plan identified digital municipal parcel boundaries as a fundamental need to support town planning and development. Since that time dozens of towns have invested in high quality parcel maps over the years, and state funding (1989-91) supported conversion of existing paper property maps into digital data. Digital parcel data help municipal officials to perform a more accurate property tax assessment. Towns link the parcel data to their Grand Lists and then are able to have detailed tax information. Municipal tax officials, realtors, planners, and property developers use this data to show taxpayers how proposed development or changes in municipal services and regulations will affect them. In many towns, parcel data helps to assure fair tax distribution, plan services, provide public notices, and many other municipal functions.



Only about 30 of VT's 255 towns do not have any digital parcel data. VCGI distributes data for 186 of the towns that do have it, although that data varies quite a bit in terms of age and quality. We hope to increase the number of towns participating in our data distribution process in 2016.

There is a growing interest in having a statewide parcel database. In 2015, a group of several agencies interested in statewide parcel data continued meeting to coordinate a statewide digital parcel data effort. VTrans, ACCD, ANR, Dept. of Taxes, RPCs and several other agencies have voiced strong support for such an effort.

VTrans hired AppGeo, a private contractor, to develop a Return on Investment Study and a Parcel Lifecycle Report. These documents are invaluable in the discussion about the value of statewide parcel data as well as the mechanisms we should pursue to create a sustainable statewide data development and maintenance system.

VTrans has confirmed their willingness to fund 80% of the initial costs to develop consistent statewide parcel data (phase 1). They are working with ACCD to solicit additional funding from other state agencies. Program structure and funding for phase 2 (ongoing updates to the parcel data) remain to be determined.

Protected Lands Database

Representatives from the VT Land Trust, The Nature Conservancy, Green Mountain National Forest, VHCB, VT Agency of Natural Resources, VCGI and the UVM Spatial Analysis Lab have all been engaged in an effort to update the attribute schema of the Conserved Lands database in preparation for development of a coordinated procedure (hosted by VCGI) to update the data on an annual basis. VCGI staff have designed a geodatabase and have distributed it to the group. The data creators listed above have agreed to provide the data in a format that meets the schema they have all worked on developing, so that the actual compilation will be as easy as possible for VCGI. This effort should result in an update to the Conserved Lands Database early in 2016. The last update was made in 2009.

The value in this effort is that all of the data creators benefit from the data provided by the others, the organizations wish to avoid data distribution overhead and all of the data is available from a single location. As a result, it is worth their while to contribute their portion of the data to VCGI to distribute. Other users of the data include land managers around the state and land use planners.

Conclusion

VCGI and state agencies leveraged their investments in geospatial technology to support a wide range of business needs in 2015. VCGI completed its transition into a new Division within the Agency of Commerce and Community Development, and is ready to embrace new opportunities within the State. The State's Enterprise GIS Consortium (EGC) continued to make significant strides toward advancing the "efficient use of the state's Geographic Information Technology resources". The EGC has furthered this goal by improving and simplifying access to geospatial data and services, and by providing a venue where agencies can coordinate efforts. VCGI anticipates that 2016 will be another productive year, with opportunities to reframe the role of VCGI and refine the roadmap for the future Vermont's Geographic Information System.